Holding the Fort

How did bridges happen?

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Hi!

- I've worked on Matrix bridges for close to a decade.
- Over the years I've written 5 bridges, and maintained 3 bridge libraries.
- This has generated some unique insights into both how to structure bridges, communicate with your communities, and keep Matrix moving in the right direction.

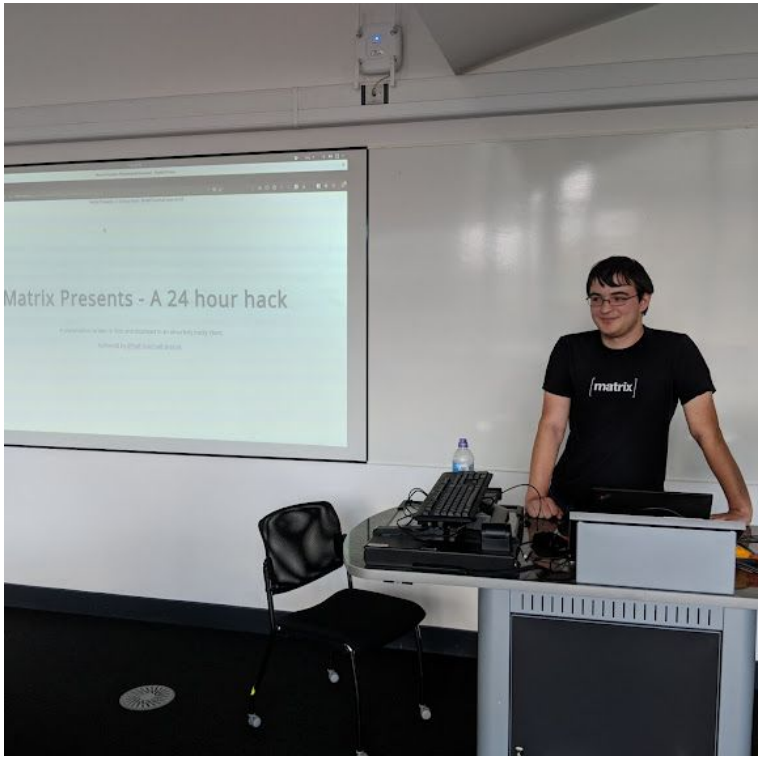
Hi!

I have since moved on from bridges to take care of various bits of the Element stack, as a agent of chaos going around and filling in the gaps of our software, wherever that may be.

Oh yes, I work at **Element**.

Hi!

This was me when I started giving talks on Matrix.



Hi!

And now I work on different parts of the infrastructure.

The *Agenda*

- Anatomy of a bridge
- Brief overview of some bridge problems we encountered.
- Deep dive into the evolution of the IRC bridge.
- Covering some spec changes could that solve bridge issues.

One last thing

If you have questions, feel free to Interrupt ✋.

This is the last talk of this track, and some of us have had a few late nights. The content will be light, and so if you have a question then just ask :)

I wrote this talk this morning, so i probably forgot stuff

the matrix conference

Anatomy of a Bridge

Anatomy of a Bridge

Discord 4 bridges	Slack 4 bridges	Signal 1 bridge
Telegram 1 bridge	WhatsApp 1 bridge	Messenger 2 bridges
iMessage 1 bridge	Mattermost 2 bridges	Google Chat 1 bridge
Mumble 1 bridge	Instagram 2 bridges	LinkedIn 1 bridge
X 1 bridge	Skype 1 bridge	SMS 3 bridges
Email 1 bridge	IRC 2 bridges	ActivityPub No bridge
Nextcloud Talk No bridge	KakaoTalk 1 bridge	GroupMe 1 bridge
LINE 1 bridge	WeChat 2 bridges	Tencent QQ 1 bridge
Tox No bridge	XMPP 2 bridges	Zulip 1 bridge

How many of you have used a bridge?

How many of you have worked on a bridge?

Great, you are probably on the left here.

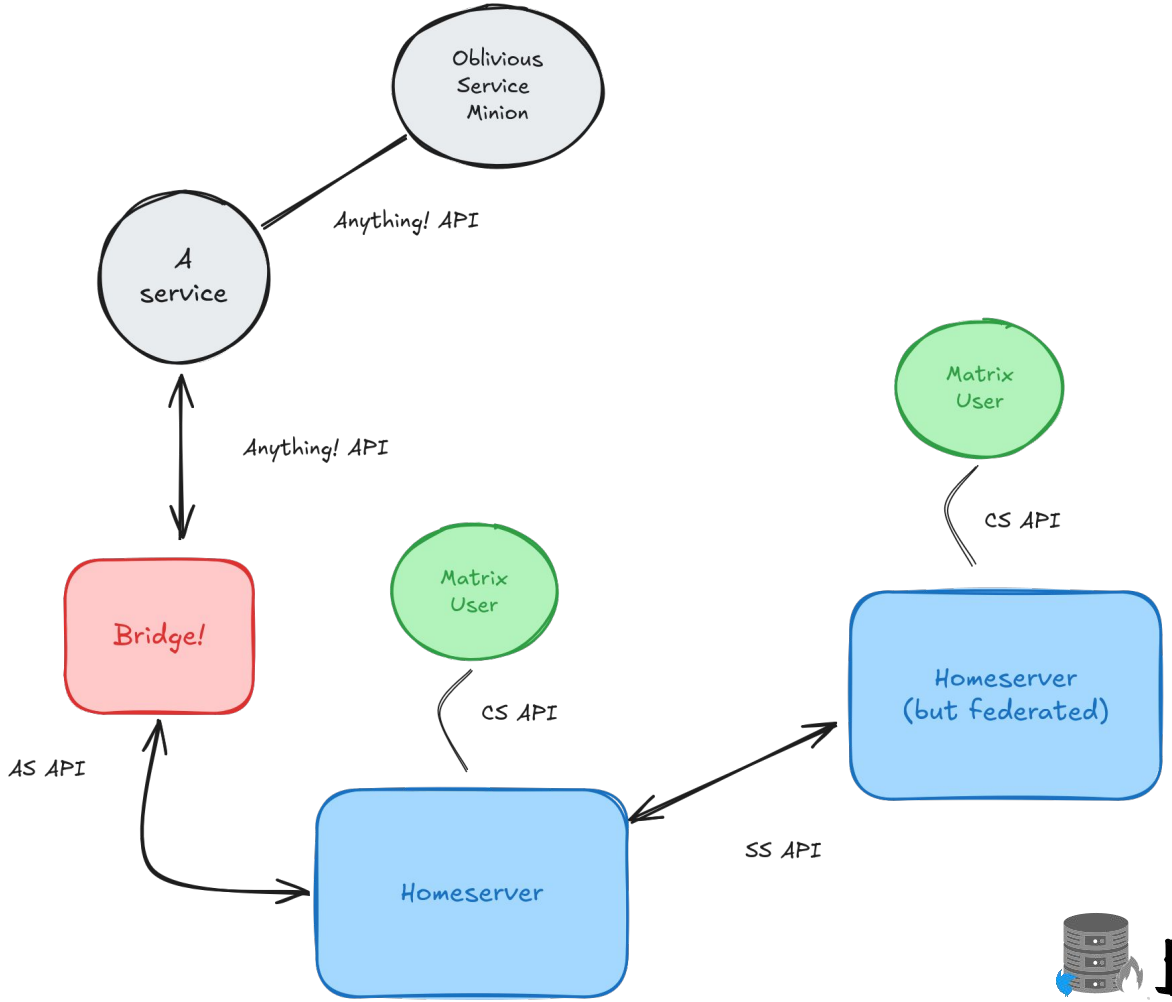
If no hands were raised, you all now have some homework :)

Anatomy of a Bridge

At its simplest, a bridge exposes users on Matrix to users on another service.

A good bridge will try to use the native constructs of each platform to make the communication feel natural.

This is not always possible.


Oblivious Service Minion
Anything! API
A service
Anything! API
Matrix User
CS API
Bridge!
Matrix User
CS API
Homeserver (but federated)
AS API
Homeserver
SS API

Anatomy of a Bridge

No two services are quite alike:

Sometimes we have a nice well-documented specification like XMPP and IRC.

Sometimes we have at least an API like Teams or Slack (mostly)

And sometimes we have to get our tools out and reverse engineer the damn thing.

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Are you *sure* the homeserver can handle it?

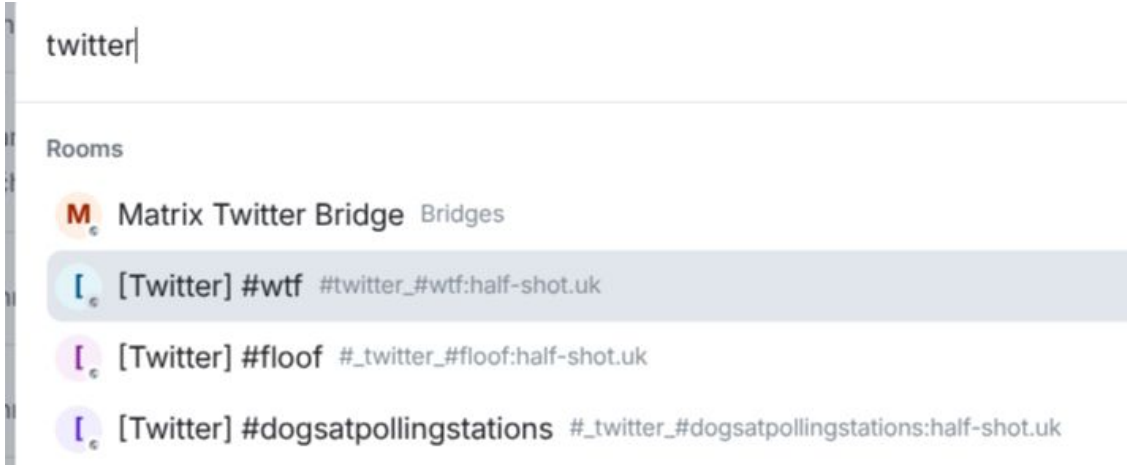
First bridge

- The first bridge I worked on was the Twitter bridge.
- This was back in ~2017 when we liked Twitter, for the most part.
- In Synapse years, this was Synapse v0.20.0 .
- In NodeJS years, this was Node.JS v6

https://github.com/Half-Shot/matrix-appservice-twitter

First bridge

- It was great.
- We allowed users to subscribe to any hashtag they wished.
- We also created a Matrix user for each Twitter user who posted.



*we don't host matrix.org in ovh :)

First bridge

- It also set fire to the matrix.org homeserver very quickly.

*we didn't host matrix.org in ovh :)

Lesson One

Matrix gives you some very powerful tools.

Synapse (and other homeservers) try to protect you from shooting your foot.

It is *quite* easy to turn that off. Make sure you add in protections.

Don't do this

```
id: "Twitter"
url: "http://127.0.0.1:1234"
as_token: "fibble"
rate_limited: false # XXX: This is fine, I think
```

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IRC Bridging is HARD

IRC bridges are HARD

For this segment, let's talk about one of the hardest bridges to write. The theory is easy right?

IRC has PRIVMSG, Matrix has m.text

IRC has online/offline/away, Matrix has presence

IRC has DCTC, Matrix has...media.

What could go wrong?

IRC bridges are HARD

Well…

IRC bridges are HARD

The IRC bridge has to therefore spend a lot of time aligning the state of Matrix with IRC, which is vastly cheaper to compute on the IRC side than it is for Matrix.

And a lot of our early bugs were patching up these gaps

IRC bridges are HARD

We also made a few design decisions at the time that were...unhelpful later.

Using the IRC nick as the localpart for Matrix users was useful for finding users, but unfortunately IRC users can *change nick*.

IRC bridges are HARD

IRC also just supports less of the rich content that Matrix does (by design). Let’s look at an extreme example.

Messaging alignment is HARD

Messaging alignment is HARD

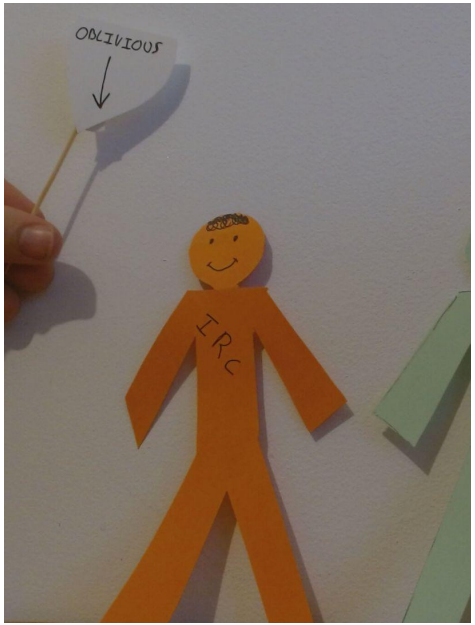
<Matrix user phones IRC user>
<ring ring, ring ring>

Messaging alignment is HARD

<Matrix user phones IRC user>
<ring ring, ring ring>

Messaging alignment is HARD

<Matrix user phones IRC user>
<ring ring, ring ring>
<IRC user…is oblivious>



Messaging alignment is HARD

<Matrix user phones IRC user>
<ring ring, ring ring>
<IRC user…is oblivious>
<Matrix user is unhappy>

Fewer Features?

MSC4110: Fewer Features could solve this!

matrix-spec-proposals/4110

Beeper has actually implemented a version of this with differences, shoutout to the cameraman Tulir for iterating on this proposal.

Now make sure he submits the diff upstream please :)

https://github.com/mautrix/go/blob/main/event/capabilities.d.ts

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Storing bridge things is hard

Storing bridge things is hard

- Bridges need to store:
  - Which users map to who on both networks.
  - Which rooms are bridged to which things.
  - Custom configuration users may set.
  - Authentication for users connecting to another network
  - Some amount of caching.

Storing bridge things is hard

- So uh, the first version of the matrix.org bridges used a file based storage mechanism called NeDB.
- It provides a Mongo-like interface.
- It’s also prone to deletion.
- Yes, this happened once. Thankfully, we managed to recover the service.

Storing bridge things is hard

- We ended up switching the bridges to Postgresql.
- *Except* for Hookshot. That uses room state for persistent storage and Redis for caching.
- I strongly suggest whenever you build a bridge, try something battle tested :)

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Thank you!

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Oh

And one more thing

Put on your **future** goggles

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Demo

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Thank you!

Any questions?